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Analysis of factors influence the installed capacity of electricity from renewable sources in the EU member countries

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Abstract

The paper "Analysis of factors influence the installed capacity of electricity from renewable sources in the EU member countries" examines a series of nine socio-economic factors that might influence the installed capacity of electricity from renewable sources. The analysis is done to the first ten European countries that registered the most important values of installed power capacity electricity from renewable sources. This econometric analysis leads to conclusion: all socio-economic factors taken for analysis influence the endogenous variables.

Keywords: European Union, installed capacity, multiple regression, renewable energy

1. Introduction

In the paper "Analysis of factors influence the installed capacity of electricity from renewable sources in the EU member countries" aims to analyze factors influencing the installed capacity of electricity from renewable sources. For analysis were taken first ten EU countries that registered the most important values of installed capacity of electricity from renewable sources. For this analysis will use Student Test, data were obtained using

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Microsoft Office: Excel. In order to achieve the econometric analysis we used two theoretical literature sources: Duguleana L. and Duguleana C, 1998 and Duguleana L., 2002.

Exogenous and endogenous variables are shown in Table 1.

Table 1. Exogenous and endogenous variables, according to according to the installed capacity of electricity from renewable sources

Country	Installed capacity of electricity from renewable sources (MWh)	Population	HICP inflation rate (%)	GDP per capita in PPS (%)	Unemployment rate (%)	Energy dependence (%)	Net imports of electricity (GWh)	Inequality of income distribution Gini coefficient	Final electricity consumption per capita (KWh per capita)	Electricity prices in households (EUR/100 KWh)*
Germany	45598	81751602	2.50	120	7.50	60.90	-20101	29.30	6392	22.90
Spain	39128	46152925	3.10	99	18.00	81.40	-11039	33.90	5860	16.80
France	30119	65000000	2.30	107	9.50	51.20	-48006	29.80	6772	12.30
Italy	29845	60340328	2.90	101	7.80	85.40	40035	31.20	5180	20.00
Sweden	20491	9415570	1.40	126	8.30	38.00	-1961	24.10	14010	16.50
Austria	16247	8400000	3.60	129	4.80	69.70	4863	26.10	7141	19.10
United Kingdom	10580	62026962	4.50	108	7.60	26.10	11022	25.40	5583	14.10
Portugal	8392	10636979	3.60	77	9.60	83.00	9431	33.70	4554	15.90
Romania	6382	21414000	5.80	49	6.90	27.70	-4248	33.30	1940	9.80
Finland	5008	5375276	3.30	116	8.20	55.00	12772	33.00	15586	12.90

*Real prices, all taxes included 2nd semester, 2009

2. The specificity of model

To study how the installed capacity of electricity from renewable sources may be influenced by population; inflation rate; GDP per capita in PPS; unemployment rate; energy dependence; net electricity imports; unequal income distribution, Gini coefficient; final electricity consumption per capita and household electricity prices, the model can be constructed as:

$IC = a_0 + a_1\ Pop + a_2\ HICP + a_3\ GDP + a_4\ UnEm + a_5\ EnD + a_6\ Imp + a_7\ Inc + a_8\ ElCon + a_9\ ElPrt + \varepsilon_t$,

Where:

IC = Installed capacity of electricity from renewable sources MWh;

Pop = Population;

HICP = HICP inflation rate %;

GDP = GDP per capita in PPS %;

UnEm = Unemployment rate %;

EnD = Energy dependence %;

Imp = Net imports of electricity GWh;

Inc = Inequality of income distribution Gini coefficient;

ElCon = Final electricity consumption per capita KWh per capita;

ElPrt = Electricity prices in households EUR/100 KWh;

$a_0, a_1, a_2, a_3, a_4, a_5, a_6, a_7, a_8, a_9$ = model parameters;

ε_t = error specification.

Using the method of least squares for estimation of parameters, we obtained the following results:

$IC = -455814 - 0.001\ Pop - 51472{,}6\ HICP + 3764{,}45\ GDP + 1068{,}86\ UnEm - 3594{,}77\ EnD + 1{,}14\ Imp + 22238{,}42\ Inc - 23{,}40\ ElCon + 449{,}37\ ElPrt + \varepsilon_t$,

$R^2 = 1$ (Table 2);

n = 27;

(.) t Student Table 3.
Where:
R^2 = coefficient of determination;
n = number of European Union member countries that have made observations;
t Student = Student distribution variation.

Table 2. Regression Statistics

Regression Statistics	
Multiple R	1
R Square	1
Adjusted R Square	65535
Standard Error	0
Observations	10

Table 3. Coefficients of the model and Student variables

	Coefficients	Standard Error	t Stat
Intercept	-455814	0	65535
X Variable 1	-0.00122	0	65535
X Variable 2	-51472.6	0	65535
X Variable 3	3764.454	0	65535
X Variable 4	1068.864	0	65535
X Variable 5	-3594.77	0	65535
X Variable 6	1.140411	0	65535
X Variable 7	22238.42	0	65535
X Variable 8	-23.3988	0	65535
X Variable 9	449.3709	0	65535

In the table represents regression analysis Table 2 is observed a coefficient of determination (R^2) equal to 1. This value means that the linear model is valid, explaining a 100% variation of installed capacity of electricity from renewable sources.

Applying the Student test, is obtained a theoretical value† ($t^{\alpha/2}{}_{n-k-1} = t^{0,05/2}{}_{27-9-1=17}$) equal to 2.11, a value which we compared it with the modal values in column t State table 3. Since the modal values of the coefficients $a_0 - a_9$ in column t State are higher than the theoretical value, the alternative hypothesis H_1 is accepted through the estimators are significantly different from 0. In conclusion, we can say that all socio-economic factors taken for analysis influence the endogenous variables: installed capacity of electricity from renewable sources.

† Theoretical value of the ration Student ($t^{\alpha/2}{}_{n-k-1}$), where: α = 100-probability (95%) = 5%, n = number of observations, k = number of exogenous variables

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